17. (New) A rotor in accordance with claim 15, wherein:

said second material of said commutator leg is phosphor bronze.

18. (New) A rotor in accordance with claim 16, wherein:

said second material of said commutator leg is phosphor bronze.

REMARKS

The specification and claims have been amended to improve the style of this application. Applicant thanks the Examiner for the careful reading of the application, for pointing out discrepancies, and for providing suggestions.

Claims 1 - 3 have been rejected as being obvious over Nuss in view of Katagiri.

Claim 1 has been amended to set forth the feature that the commutator leg is formed of a metal with a melting point lower than that of copper and that the commutator leg is formed separately from a corresponding commutator segment. New claim 15 has also been added to set forth that the material of the commutator leg is formed of a material having a melting point lower than a melting point of copper. Claim 15 also sets forth that the materials of the commutator leg and the commutator segment are different.

Applicant has reviewed Nuss and Katagiri, and finds no teaching nor suggestion in either of these references of a commutator leg having a melting point lower than a melting point of copper. Independent claims 1 and 15 therefore set forth features which are not present in the combination of Nuss and Katagiri. Claims 1 and 15 therefore cannot be considered obvious in

view of Nuss and Katagiri.

Original claims 4 and 5 have rejected as being obvious over Nuss in view of Katagiri and further in view of Okuyama. The rejection states that Okuyama shows the use of metal with lower melting point than that of copper for the purpose of increasing the efficiency. Applicant has reviewed the prior art, especially Okuyama. Applicant finds no specific indication that using a metal with a melting point lower than that of copper would increase efficiency. Applicant does recognize that Okuyama describes a commutator piece joint body made of phosphor bronze. However, Applicant finds no indication in Okuyama of why phosphor bronze is preferred or desired. Okuyama does indicate that prior art DC motors have been subject to continuous improvement to increase the efficiency. However, there is no indication in Okuyama that the use of phosphor bronze in a commutator increases efficiency. Therefore the incentive for obviousness as indicated in the rejection is not found in the prior art. Applicant also does not find the incentive of phosphor bronze increasing efficiency, in the knowledge generally available to one of ordinary skill in the art. Since the incentive to combine is not found in the prior art, or the general knowledge, independent claims 1 and 15 cannot be considered obvious according to U.S. patent regulations.

Claim 15 sets forth that the second material of the commutator leg is different than the first material of the commutator segment. Support for this can be found in the specification on page 11 lines 17 - 20. Applicant has reviewed the prior art, and finds no teaching nor suggestion of a commutator leg and a commutator segment being formed of different material, especially where the commutator leg has a melting point lower than a melting point of copper.

Claim 15 therefore further defines over the prior art.

Claim 1 sets forth that the commutator leg part is formed separately from the commutator segment. Again Applicant has reviewed the prior art, and finds no teaching nor suggestion of a leg and a segment of a commutator being formed separately, especially where the leg is formed of a material with a melting point lower than that of copper. Claim 1 therefore further defines over the prior art.

Applicant has in particular reviewed Okuyama, with regard to a commutator leg and segment being formed separately, and/or of different materials. Applicant notes that Okuyama specifically indicates that a commutator piece 22 includes a contact section 22a and a terminal section 21b. Okuyama also specifically indicates that both elements 22a and 22b are to be formed as a single piece and to be punched out of a single material sheet 40. Therefore elements 22a and 22b of Okuyama, are specifically taught to be of the same material and to be formed at the same time. This is in direct contrast to the different materials and separately formed features of claims 15 and 1. Okuyama therefore leads a person of ordinary skill away from the present invention. Furthermore, Applicant finds no suggestion or motivation in the prior art which would lead a person of ordinary skill in the art to directly contradict the teachings of Okuyama. Claims 1 and 15 therefore further define over Okuyama.

Claims 12, 13, 14 and 16 set forth that the wire is formed of copper. Applicant finds no teaching nor suggestion in Okuyama, of copper, especially of a wire being formed of copper. Applicant has also reviewed Nuss and Katagiri, and also finds no teaching nor suggestion of copper wire.

It is only Applicant which has disclosed the advantageous combination of phosphor bronze commutator legs with copper wire. As the melting point of phosphor bronze is lower than the melting point of copper by 100° or more, the commutator leg can be connected with the copper wire by arc welding, and also by other thermal connection methods. As described with reference to Fig. 11 of the present application, a copper wire connected to a phosphor bronze commutator leg provides a superior connection. Since the melting point of phosphor bronze is below the melting point of copper, a heated connection would cause the phosphor bronze to be melted first. The melted phosphor bronze therefore tends to wrap around the copper wire and form a connection that has a large amount of surface area, especially where the surface area forms a complete connection. The copper wire thus does not need to be melted, or at least significantly melted, in order to form the connection. Applicant notes that a very thin copper wire can thus be used without worrying about the thermal connection damaging the copper wire. Thin copper wire has been found to be advantageous because it allows more coils or windings to be placed around the magnetic poles, thus increasing the magnetism of the poles. By the commutator leg being formed of a separate material, and/or being formed separately, the commutator segment can be formed of a material having a higher melting point. The thermal connection therefore need not significantly effect the commutator segment.

Since the prior art does not recognize the advantageous synergy between a phosphor bronze commutator leg, and a copper wire, and especially where the commutator leg can be formed of a different material than the commutator segment, the present invention is an improvement over the prior art. Applicant notes that in Okuyama both elements 22a and 22b

being formed of the same material, allows the danger that the thermal connection of 22b to a copper wire will damage the commutator segment. Applicant notes that commutator segments must be very smooth and uniform, since they are in high speed contact with the commutator brushes. Excessive heating of the commutator segments can cause distortion of the commutator segments, which could then cause premature brush failure. The present invention avoids this problem. Applicant respectfully requests patent protection for these improvements of the present invention.

If the Examiner has any comments or suggestions which would further favorable prosecution of this application, the Examiner is invited to contact Applicant's representative by telephone to discuss possible changes.

At this time Applicant respectfully requests reconsideration of this application, and based on the above amendments and remarks, respectfully solicits allowance of this application.

Respectfully submitted
for Applicant,

By: _____

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TD:tf
70459.5
Enclosed: Marked-Up Paragraph from the Specification
Marked-Up Version of the Claims

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SHOULD ANY OTHER FEE BE REQUIRED, THE PATENT AND TRADEMARK OFFICE IS HEREBY REQUESTED TO CHARGE SUCH FEE TO OUR DEPOSIT ACCOUNT 13-0410.

MARKED-UP PARAGRAPH FROM THE SPECIFICATION

~~FIG.~~ Figures 3(a) to 3(e) illustrates how a commutator leg part is installed on a commutator fitting;

MARKED-UP VERSION OF THE CLAIMS

1.——(Amended) A rotor for small motors provided on its shaft with a plurality of rotor magnetic poles of a salient-pole configuration and a commutator unit, each of the rotor magnetic poles being composed of a winding around a laminated core and each of both ends of each wound wire being connected to a commutator leg part ~~coupled with a tip of a~~, wherein:

said commutator leg parts are formed of a metal whose melting point is lower than that of copper, said commutator leg parts which are formed separately from corresponding commutator segments of the commutator unit, ~~wherein~~ being fixed to the ends of them; and

a connective portion between the both ends of each of said wound wires and the corresponding commutator leg part is formed by winding and welding a wire stripped of its insulating coat ~~and welding the wound portion~~.

4.——(Amended) The rotor for small motors, as set forth in claim 1, wherein said commutator leg parts are U-shaped ~~and formed of a metal whose melting point is lower than that of copper~~.